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ABSTRACT

The California Community Colleges Chancellor's Office funded the @ONE project for a five-year period to assess faculty training needs, build a statewide training infrastructure, and develop and deliver instructional technology training. In its last year of operation, @ONE commissioned an evaluation of its impact on faculty teaching and student learning processes and outcomes. The Center for Student Success conducted this evaluation study between January and June, 2002. The study employed a three-pronged approach: a review of the literature, combined with two separate ethnographic investigations of @ONE--one a study of two California community colleges and the other a broad survey of participants in @ONE's technology training. In evaluating the impact of @ONE training on faculty teaching, the following factors influencing the results were identified: (1) training methods; (2) training needs; and (3) organizational environment. The survey research found that 67-85% of faculty respondents indicated they are more or much more enabled to engage in a variety of instructional activities using technology as a result of the training. The study also found that systematic and routine assessment of student learning is not yet underway across courses using the new tools. Recommendations include acquiring information directly from students about the effect that integration of technology into classrooms has had on their class evaluations. (Author/NB)

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Project Overview
Overall Summary and Recommendations

@ONE Technology Training Project Study

The Center for Student Success

July 2002

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A note about this project: This report represents the first in a series of four reports from the Center for Student Success study on the @ONE technology training project and good practice in technology. All four research reports are available at: http://www.rpgroup.org/cssweb/default.htm. Any specific questions

about this report, or the Center for Student Success, should be directed to Brad C. Phillips at: Bradcphillips@yahoo.com.

STUDY OVERVIEW

INTRODUCTION

The California Community Colleges Chancellor's Office funded the @ONE project for a five-year period to assess faculty training needs, build a statewide training infrastructure and develop and deliver instructional technology training. In its last year of operation, @ONE commissioned an evaluation of its impact on faculty teaching and student learning processes and outcomes. The Center for Student Success conducted this evaluation study during January-June 2002.

The study employed a three-pronged approach. This method is often referred to in the evaluation literature as triangulation on truth; an attempt to fully examine the impact of an intervention by conducting an assessment using multiple approaches. Multiple approaches can help to better explain the impact of intervention than any one single methodology. Beginning with a review of the literature related to faculty development in instructional technology, two separate investigations of @ONE were conducted using both an ethnographic approach, namely, a study of two California community colleges, and a broad survey of participants in @ONE's technology trainings.

Key personnel were recruited for this evaluation. An expert with significant experience in conducting a literature review was retained along with two ethnographic researchers who conducted the on-site campus visits. In addition, experts in survey research were used to develop and conduct a survey of faculty who engaged in @ONE training. Each of their reports, beginning with the literature review, followed by the ethnographic study and concluding with the survey research outcomes, provides a detailed review of their findings. While the three reports can stand alone as a separate review, this summary uses findings from all three investigations to assess the impact of @ONE trainings on faculty and student learning processes and outcomes. The Center for Student Success concludes the summary with a series of recommendations. The summary is followed by detailed reports for each of the three approaches.

SUMMARY OF FINDINGS

I. Impact of @ONE Trainings on Faculty

In evaluating the impact of @ONE trainings on faculty teaching, a number of intertwining factors were identified that influence the results of faculty development in instructional technology and, subsequently, their effects on teaching and student learning processes and outcomes. These factors include: 1) training methods; 2) training needs; and 3) organizational environment (faculty

cultures as related to adoption and infusion of technology, and overall support for instructional technology).

The literature places significant emphasis on the differentiation of faculty in early adopters and second wave instructional technology users, their concerns in adopting instructional technology, and the type of organizational elements and characteristics that are conducive to successful faculty development in instructional technology. All these aspects influence each other and the overall success of any higher education institution in integrating instructional technology in curriculum across the campus.

As found through the ethnographic study, @ONE's role at Fresno City College (FCC) was to support the early adopters and show the mainstream faculty "what was possible" at the Summer Institutes. @ONE also connected FCC faculty in technology projects across the disciplines. At Santa Monica College (SMC), @ONE bolstered the early adopters and growing mainstream users of instructional technology. In both colleges, @ONE helped create a vision that supported technology integration. However, @ONE was only one of many drivers pushing technology integration.

The literature review suggests a set of basic "enabling factors" without which the likelihood of successful deployment and implementation of instructional technology is reduced. These factors include: universal student access, reliable networks, multiple opportunities for training and consulting, and a faculty ethos that values experimentation and tolerates failures. These enabling factors, coupled with a strong commitment to campus wide systematic technology planning and funding, address most of the faculty concerns identified in the literature. These concerns cover a broad spectrum of issues ranging from the reliability of the equipment and its technical support, to availability of support staff and training, to implications for teaching and learning. Training itself, if properly designed and conducted, can address at least some of these concerns.

The ethnographic study confirmed the importance of these enabling factors. The study found that three primary variables had a pronounced impact on either supporting or compromising training initiatives in the two colleges: leadership, infrastructure, and funding. At FCC, it was not until the late 1990s that leadership at both the college and district level made technology integration a high priority. The college's financial situation became stronger then and a major infrastructure project improved the network. Recently, more access to computers and the Internet has been provided for students and faculty. At SMC, the leadership has consistently prioritized instructional technology implementation and integration. The college has had an adequate network bolstered by a large Information Technology support staff since the mid 1980's. The college has also allocated considerable resources to provide adequate access to computer labs for student work and faculty development.

In terms of instructional technology training modalities, the literature discusses various strategies and good practices both from a single campus perspective as well as joint training and development efforts conducted through consortiums of colleges and universities or non-campus based entities, similar to @ONE.

The literature underscores the need for developing training modalities that emphasize pedagogical principles and techniques as much as they teach technology. Such training modules should blend the tenets of evolving research in the domain of learning with the technical features embedded in various technologies.

Most authors indicate that successful training should follow as many of the following characteristics as possible:

- Training should be recurrent and linked to actual practical situations. Faculty development in instructional technologies needs to constantly reinforce the skills learned and be placed into the context of actual classroom teaching and learning, whether the teaching and learning occur in a traditional, on-campus environment or in a virtual environment.
- Training should be reinforced by follow-up with instructors to ensure that instructors are integrating what they learned into their teaching and curriculum. Such follow-up could be conducted by the trainers themselves or by designated instructional technology liaisons at each campus.
- Learning from peers has been found to be highly effective in the academic environment. Showcasing examples of successful integration of instructional technologies by other instructors, particularly those in the same discipline, should be a training approach pursued on a systematic basis.
- As in the delivery of instruction for students, faculty development in instructional technology should be "just-in-time" and on-demand including virtual faculty development, electronic communities and self-paced faculty development. The "just-in-time" and on-demand requirements assume constant monitoring of faculty training needs. Local faculty development centers may be best positioned to respond to such demands. In addition, local centers can provide the continuous technical support that faculty may need and more quickly respond to various questions and concerns that faculty may have.

Many of these characteristics of best practices in instructional technology faculty development were confirmed through the ethnographic study. While the pace of technology integration varied, the two colleges studied have recently seen the focus of their training change as faculty demand shifted from computer literacy and software-oriented training to more specific classroom applications. The survey research paralleled the findings of the ethnographic research in terms of the types of training in which faculty are most interested. Faculty survey respondents were most likely to participate in @ONE's training modules on

creating an instructional website, collaborative learning using online tools, designing technology-enhanced instruction, and *discovering multimedia* more than in *Microsoft Office training units, using email to support instruction, Internet research strategies to support instruction*, or using the various other resources available on the @ONE's web site. While the length of time these learning opportunities have been available may have influenced the distribution of participation frequency, it appears that training opportunities that focus on linking technology to classroom and instruction are more appealing to faculty than training focusing on software-specific applications (e.g., Microsoft Office) or very general skills (e.g., Internet research).

As indicated in the ethnographic study, the preferred training format has changed as well from workshops that teach basic computer skills to sessions that help individual instructors integrate technology into a specific course. Intensive institutes remain popular, especially if provided outside instructional days and focused upon greater uses of web research, web-linked course resources, web-based course management and email for communication. From the survey research, respondents indicated that participation in @ONE's trainings was relatively evenly distributed between regional training, campus-based training and online tutorials with slightly less frequency in regional training opportunities. These findings suggest that regional training is most effective in the early stages of development and that local training is most effective during the later phases of curriculum integration. Training also needs to change emphasis over time, becoming increasingly individualized as faculty users master the basics and become more interested in applying instructional technology in the classroom.

@ONE has been able to provide a range of training options varied in both format and content that has attracted a large number of faculty over its five-year existence. A common finding between the literature review and the ethnographic study is the importance of monitoring training needs. @ONE conducted periodic surveys to determine the training needs of faculty across California community colleges and incorporated the results of these surveys in the development and delivery of its training modules.

The survey research indicated that the majority of faculty respondents who participated in @ONE's trainings found it very useful. Faculty were also positive in evaluating the integration of concepts or techniques learned during @ONE training into their instruction. Of those who expressed an opinion, 83% integrated at least some of the concepts or techniques learned during @ONE training into their instruction and more than half indicated that they had integrated many or almost all of the concepts or techniques learned during @ONE training into their instruction.

In addition, faculty who participated in the @ONE Project training clearly perceive that they are more enabled to engage in a variety of instructional activities since their training. These activities include:

- Creating activities and lessons using technology
- Using an instructional website to support student learning
- Providing students with more visual information and examples
- Providing more timely feedback on assignments or examinations
- Producing a multimedia presentation (an interactive, computer generated text, graphic, sound or video presentation)
- Interacting with students by way of asynchronous electronic communication (such as email, bulletin boards or discussion groups)
- Interacting with students by way of real time electronic communication (such as chat, MOO, instant messaging)
- Consciously addressing varied learning styles (visual learners, reflective learners, etc.) by integrating technology into instruction and/or assignments
- Using simulations to enhance learning

From the survey, 67% to 85% of the respondents indicated that they are more enabled or much more enabled to engage in such practices as a result of participating in @ONE trainings. Over 50% of faculty who integrated the @ONE technologies report that they are much more likely to engage in *using an instructional website to support student learning* and *providing students with more visual information and examples* since their @ONE training.

Faculty were also asked to provide an open-ended response to a question regarding what the @ONE trainings enabled them to do. Several themes emerged from these responses. The clearest theme was that it had enabled them to become better teachers. Whereas the responses varied from the general to the very specific, many of the faculty participants pointed to improvement in their teaching as the most important result of the @ONE Technology Training Project. Other themes included increasing confidence and facility with technology, becoming a technology facilitator for other faculty, and learning specific techniques and concepts.

The ethnographic research provided many examples of integration of instructional technology in the curricula of the two colleges. Although none of these activities can be casually related to @ONE training, there appears to be an association, as most technology users at FCC have participated in one or several @ONE training sessions. The skills, confidence, motivation and camaraderie they gained there – and at other technology training sessions – have broadened their understanding of the possibilities of technology.

II. Impact of @ONE Trainings on Student Learning Processes and Outcomes

Addressing the question of impact of @ONE trainings on student learning processes and outcomes has proved challenging primarily due to the general

lack of documented research on measurable, rather than perceived, indicators of student learning outcomes resulting from the integration of instructional technology.

The literature contains a wealth of information that emphasizes processes and organizational factors that enable the integration of information technologies throughout campuses and curricula. However, there is little in terms of discussion of the impact of faculty development in instructional technology on student learning outcomes. Most accounts of impact on student learning outcomes are based on student or faculty responses to surveys or participation in focus groups. Whereas survey and focus group research is an important tool in evaluations, both formative and summative, the lack of research on student learning outcomes based on observed and measurable indicators is one of the major findings of the literature review. Without such research it is impossible to assess whether perceptions match actual results. In addition, it makes it more difficult to argue for the value added of instructional technology in environments that are or will face budgetary constraints.

Nevertheless, some authors found that instructional technology has many positive influences on student learning processes and outcomes, such as: (1) use of instructional technology positively affects student learning; (2) use of instructional technology increases student interest and satisfaction; (3) role of faculty and their ability to use instructional technology are major factors (hence, the need for training and continuous upgrading of skills); and (4) certain instructional technology techniques better facilitate certain learning activities. Other authors found that online materials are particularly effective at engaging students either by offering the latest images and results which are not available in textbooks, or by allowing students to explore the topic at their own pace and test their understanding as they proceed. These authors also argue that instructional technologies facilitate the shift towards a more student-based learning environment, which is consistent with the Seven Principles of Good Practice[1].

Instructional technologies already available provide critical features that can greatly enhance learning processes. These technologies allow the creation of interactive environments, which can promote active learning as students make decisions about exploring and interpreting a content area. Technologies allow the

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[1] *The Seven Principles of Good Practice* first appeared in 1987 (Arthur Chickering and Zelda Gamson). They include active learning, maximization of student-teacher and student-peer interaction, communication of high expectations, prompt feedback, emphasis of time-on-task and respect for different learning styles. In 1996, Arthur Chickering and Stephen Ehrmann suggested technology integration and diffusion be guided by the Seven Principles: Chickering, Arthur and Stephen C. Ehrmann (1996), "Implementing the Seven Principles: Technology as Lever" AAHE Bulletin, October, pp. 3-6. Which kinds of technology use can help faculty and students implement Chickering and Gamson's "Seven Principles of Good Practice in Undergraduate Education?" This classic essay summarizes some of the key possibilities.

creation of varied information formats, which in turn allow for different learning opportunities. Communication tools can help promote socially situated learning environments, which can enhance the quality of learning and the development of teamwork and learning communities. Perhaps the greatest potential of instructional technologies is the facilitation of formative assessment, both structured and open-ended, to encourage the study of foundational information as well as student reflection and development of meta-cognitive skills. Authoring tools promote the construction of knowledge, facilitate students' use of different information formats and associated cognitive styles, and represent major assessment approaches for learning-centered and inquiry-oriented pedagogies. Simulations enhance students' critical inquiry skills and epistemological skills.

The ethnographic research revealed the same lack of systematic assessment of student learning as found in the literature review. FCC conducted surveys that revealed that a great increase has taken place in faculty use of email, Internet research, multimedia presentations and other technology applications. The college has not, however, begun to assess whether or how technology is enhancing solid pedagogy or teaching and learning.

At SMC, assessment of student learning and students' uses of instructional technology or specific course learning outcomes has not yet developed into formal research. Students have, however, been asked about their access to computers and to the Internet at home or at work, their skill levels with computers, and other aspects of their needs. As expected, the responses have changed dramatically over time as students' access to home computers and online resources has improved. The location of the college in a higher socio-economic area no doubt affects the higher levels of student access to computers and the Internet. Informal surveys by individual instructors at SMC are more common and feedback from students has helped shape changes in technology uses by faculty.

Thus, the findings of the ethnographic study suggest that systematic and routine assessment of student learning is not yet underway across courses using the new tools. At this point, neither college has much more than anecdotal evidence to support that technology integration increases student motivation and performance, much less learning. At both colleges, faculty expressed keen interest in beginning such assessment.

Although the ethnographic study had little empirical evidence of the effect of technology training on student learning, the survey research conducted as part of this evaluation study specifically asked faculty about their perceptions regarding the impact of incorporating concepts and techniques learned through @ONE trainings on student behavior and learning. Faculty responding indicated that their students were more enabled or much more enabled to engage in a variety of positive behaviors and to express greater interest or satisfaction with a course following their integration of the @ONE Technology Training Project training in

their instruction. The specific student behaviors which faculty were asked to rate included:

- Search for answers to questions rather than ask instructor
- Apply what students are learning to real world questions
- Work in teams or groups
- Complete the course
- Take more responsibility for learning
- Participate more in class discussions
- Come to class more prepared
- Be more actively engaged with course material
- Express greater interest or satisfaction with the course

In open-ended comments, faculty also perceived an effect of their participation in the @ONE Technology Training Project on the students in their classrooms. Faculty perceived most clearly that the integration of the concepts and techniques of their @ONE training had the effect of enabling their students to become better learners in a variety of ways. Additional themes in faculty comments included increasing communication and class participation, achieving better information access, obtaining more experience with technology, and having a richer learning experience. Each of these themes is repeated throughout the comments by faculty, providing testimony to the positive effects they perceive that they have brought to their classroom, websites, and online experiences for students.

THE STAGES OF DEVELOPMENT TABLE

Given the work of the three groups, the project consultant and the research team felt it important to develop a model for colleges to provide better understanding of the stages of faculty development regarding technology integration. The Stages of Development Table illustrates (a) that the level of organizational preparedness affects faculty participation in technology diffusion and integration and (b) that professional development activities change as the organizational conditions become more favorable and as more faculty members participate in technology diffusion and integration. These stages are ordered from 1 to 4, with Level 4 being the highest. However, the levels are not orthogonal and colleges may be partially in any one or more of the levels at any one time.

The four levels are described below:

Level 4: Full Momentum

- Technology is being integrated and diffused throughout the college. The organizational conditions are supportive, the majority of mainstream faculty participates, and an increasing number of instructors use technology to advance student-centered learning. The professional development activities focus on student learning and student outcomes.

Level 3: Gaining Momentum

- Technology integration and diffusion is building momentum. The organizational conditions are becoming increasingly supportive. The number of mainstream users is increasing and the focus is increasingly discipline-specific and designed to promote student learning. Professional development activities focus on course specific software and class management tools.

Level 2: Building on the Groundwork

- Technology integration and diffusion is advancing, although still at a slow pace. The organizational conditions have reached a level of development where they offer some, but limited support. More early adopters are emerging, a few mainstream faculty members are beginning to experiment with technology applications inside and outside of the classroom. Professional development activities focus on course management and teaching delivery.

Level 1: Early Groundwork

- Technology integration and diffusion is just beginning. The organizational conditions to support integration are undeveloped and uneven, and faculty participation is largely limited to early adopters who are "doing their own thing." If professional development activities are offered at this stage, they tend to focus on basic software applications.

In considering the table, it is important to note that the pace will be set by the organizational development conditions, a complex variable that describes the leadership commitment, the funding and the infrastructure each college has in place to support technology integration.

Of course, each campus will vary in its path to increased integration. For example, college leadership at all levels may be highly supportive, while the funding situation may reduce progress, if temporarily. Alternatively, a college may have an excellent infrastructure, but lack the leadership to make integration a high priority. The table should allow colleges to estimate where they are in terms of organizational development conditions, faculty technology integration and professional development. Once a college has made this assessment, however, it needs to consider each individual variable to identify local forces that accelerate or limit progress.

In order to help understand the table, the following explanation of terms is provided below.

Organizational Development Conditions

- **Leadership**: Level of support from the CEO, key decision-making groups such as the Academic Senate and Curriculum Committee, faculty and staff.

- **Funding**: The amount allocated to technology integration and the source of this funding.
- **Infrastructure**: The level of IT support staff, the state of the network, the access students and faculty have to computer labs and the adequacy of the technology provided in these labs.

Faculty Technology Integration and Diffusion

- **Participants:** The level and types of faculty participation.
- **Uses:** The ways in which technology is used.
- **Assessment:** Evaluation of the impact technology integration has on student learning and outcomes.

Professional Development Activities

- **Focus:** The type of professional development activities being offered.
- **Delivery:** The way in which professional development activities are being delivered, for example, workshops versus individualized training.
- **Format:** Regional versus local.

Stages of Development:
Fostering Instructional Technology

Organizational Development Conditions	*Technology Integration & Diffusion*	*Professional Development Activities*
	Level 4: Full Momentum	
Leadership: High commitment across all levels **Funding:** Annual budget line item established **Infrastructure:** Effective, fully staffed, 85% desktops	**Participants**: Majority mainstream faculty **Uses:** Student-centered, 7 principles of practice **Assessment:** Pervasive focus on student learning	**Focus**: Student outcomes & assessment; interactive web **Delivery**: Individualized, student-learning, web applications **Format:** Mostly local, fully staffed with campus trainers
	Level 3: Gaining Momentum	
Leadership: Not all supportive, but in key areas & at the top **Funding:** Larger grants, not yet budget line item **Infrastructure:** More functional, more staff, 50% desktops	**Participants**: More & more mainstream faculty users **Uses:** Discipline-specific, more focus on learning **Assessment:** Uneven, both individual and college-wide	**Focus**: Course-specific software; websites, email **Delivery**: Group workshops, shift to individual help **Format:** Fewer regional, more local workshops
	Level 2: Building on Groundwork	
Leadership: Gathering support by leaders, still uneven **Funding:** A few grants and one-shot district funding **Infrastructure:** Launched, limited services, 30% desktops	**Participants**: More early adopters, very few mainstream **Uses:** Course management & teaching delivery **Assessment:** Spotty at best, some individual surveys	**Focus**: Course records, teaching delivery, PowerPoint **Delivery**: Groups primarily **Format:** Regional and local workshops, summer institutes
	Level 1: Early Groundwork	
Leadership: Very few and uneven at best **Funding:** One or two short-term grants **Infrastructure:** Very limited network & staff; few desktops	**Participants**: Early adopters only **Uses:** Largely rudimentary, basic software **Assessment:** Rare, if any	**Focus**: Generic, word processing, spreadsheets **Delivery**: Workshops on wide applications for delivery **Format:** Regional workshops, rare local training resources

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SUMMARY CONCLUSIONS

The ethnography and survey research indicates that, overall, @ONE has had a positive influence on the faculty served. @ONE has served a role in creating a vision of "what is possible" in terms of faculty development related to instructional technology. Faculty who participated in @ONE trainings expressed a high level of satisfaction with the usefulness of the training as well as with the contribution of such trainings to the integration of instructional technology concepts and techniques into their teaching and curricula. @ONE has actively tried to provide a range of training opportunities that cover various formats – from regional to online training – and content – from teaching software-specific applications to modules that emphasize pedagogy and classroom applications.

However, as indicated by the literature review and the ethnographic research, as colleges and faculty transition from pioneering to integrating instructional technology across campuses and curricula, the need for locally-provided and sustained training infrastructures becomes more critical. Groups such as @ONE can continue to be instrumental in the overall effort of enhancing faculty development in the area of instructional technology but the modes of training delivery that they provide should become more closely linked to campus-based efforts. @ONE's support of local training efforts and the development of the CCC Trainers' Network were in recognition of this. Furthermore, campuses need to engage in some systematic efforts to better understand and quantify student learning outcomes as technology is more integrated into classroom instruction.

RECOMMENDATIONS

The following section is the comprehensive list of recommendations made by the Team. Each of the individual reports also contains these recommendations.

Literature Review Recommendations:

1. Training modules should blend pedagogical principles and technological features. Training modules should be linked as much as possible to actual practical situations and should focus on pedagogical innovation and student learning.

2. To the extent possible, training should try to keep the technology transparent. Training should allow faculty to pursue pedagogical and content goals without being hindered by prohibitive technology-learning curves.

3. Training should be reinforced by follow-up with instructors to ensure that instructors are integrating what they learned into their teaching and curricula. Such follow-up could be conducted by the trainers themselves or by designated instructional technology liaisons at each campus.

4. Learning from peers has been found to be highly effective in the academic environment. Showcasing examples of successful integration of instructional technologies by other instructors, particularly those in the same discipline, should be a training approach pursued on a systematic basis.

5. As in the delivery of instruction for students, faculty development in instructional technology should be "just-in-time" and on-demand including virtual faculty development, electronic communities and self-paced faculty development. The "just-in-time" and on-demand requirements assume constant monitoring of faculty training needs. Local faculty development centers may be best positioned to respond to such demands. In addition, local centers can provide the continuous technical support that faculty may need and more quickly respond to various questions and concerns that faculty may have.

6. Training offered through summer institutes should cover a range of content such that faculty can have choices and gain greater benefits from such intensive type of training.

7. Training by itself cannot accomplish much unless campuses provide an enabling technological environment that emphasizes instructional technology integration throughout the curricula.

Ethnographic Review Recommendations:

1. A faculty-driven initiative to identify what technology can do for student learning—by discipline and program: From this list of outcomes, teaching faculty must identify the signs--or yes, the measures--of learning when using instructional technology. This work should drive the Tech Plan and the assessment of what each college is doing to diffuse instructional technology in hybrid courses or programs that combine the best of face-to-face practices with the best learning technology.

2. A comprehensive cyclical planning process with a written, flexible Tech Plan that guides development without constricting it: Programs or departments will annually submit their needs to the Tech Plan (as they did on both campuses visited), based on outcomes data in particular programs. They should thoroughly update the plan every three years, given the pace of developing hardware, software, and networks.

3. Local training and faculty development activities that reflect the needs of faculty for specific program curricula and identified student outcomes: Our current model of staff development is still the traditional approach to discreet workshops that are disconnected from the classroom. A more effective model

includes incentives for comprehensive approaches that include training, planning, piloting, assessing, and even presenting results to colleagues on campus or at conferences. As the field grows, the demand for training should shift from generic workshops to individual consultations, based on the *Seven Principles of Good Practice* (citation, page 18).

4. Commitment of the CEO, key administrators, and Academic Senate leaders: It is nearly impossible to sustain continuing growth of instructional technology without serious support from the top, the Senate leadership, and key faculty champions. Internal political wars will drain energy from thoughtful, gradual development; these wars are even more devastating than budgetary cutbacks. Every hiring committee for upper-level administrators and deans should consider candidates who are open to the best uses of instructional technology.

5. A growing infrastructure with IT leaders who understand what students need for learning and what faculty need to generate learning: In some colleges—not those the research team visited—there is still a large gap between the academic needs for technology and those for administrative MIS needs. In some cases, the staff itself has too little training in instructional technology or even networks; their training may have been in mainframe programming and colleges must support updating the skills of its IT staff in order to serve instructional needs adequately.

6. A funding plan with a minimum annual percentage of the budget dedicated to learning technology: Any given year might fall above it, but a budget policy minimum assures maintenance of progress, if not innovation. Colleges will need to supplement district expenditures with large and small grants from state, federal and private sources. Individual faculty members can seek their own grants, but this approach often strengthens one course and leaves programs inadequately served.

7. Diffusion of curriculum integration by discipline *or* program areas: Diffusing instructional technology is still in its infancy, but it is time to move past individual faculty members' interests and skills. With student expectations increasing, our most techno-wary colleagues are in an awkward position if they are not a part of changing approaches to entire course sequences and programs. Most of them will have thoughtful reasons for hesitation and their concerns should be incorporated into planning of sequence or program changes.

8. Comprehensive assessment of learning outcomes with multiple measures, as developed from the process in the first factor, above, where faculty identify the best uses of technology for learning in their program: This assessment must remain faculty controlled; researchers can help, but their role is supportive and should remain open to experimentation. Sometimes we

can learn as much from what does not work as we can from what does work. Assessment programs should include formal and informal studies, quantitative AND qualitative measures, classroom research, and yes, anecdotal evidence.

9. An Information Literacy graduation requirement and a commitment of instructors to train their own students in using course software or websites: If hybrid courses are going to be the best approach for most of our students (and the literature suggests it may be) then students with limited computer experience get bogged down trying to use the class website or joining an online class discussion.

Survey Research Recommendations:

1. Participants in @ONE training should complete evaluations immediately following their training and follow-up evaluations within six months of their training to enable timely collection of information regarding the integration of training into classroom activities and the effect of such integration on student learning.

2. Participants in @ONE training should be encouraged to document the effect of integration of training on student learning so that anecdotal information is relied upon less and empirical information relied upon more. Participants should be provided with simple research rubrics for collecting important information about student learning.

3. Consideration should be given to acquiring information directly from students about the effect that the integration of technology into classrooms has had on their evaluation of classes, including the effect that the integration has had on their learning.

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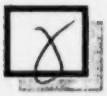

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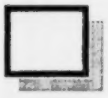

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